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(58) Field of Search

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(54) Abstract Title

**Self-sterilising hand drier**

(57) A warm air hand drier includes an ozone generator 11 which operates only when heater 6 and optionally the fan 5 are not in use and is effective to sterilise the interior of the housing 2. The fan can be used at a low speed to blow ozone through outlet 4 when the drier is not being used. The ozone generator may include a DC source applied across electrodes whereby ions are also generated. Ozone generation may be continuous when the heater is off or may be stopped a predetermined time after the last use. Operation of the drier switches the fan to "on" or to full speed, brings the heater on and stops the ozone generator.

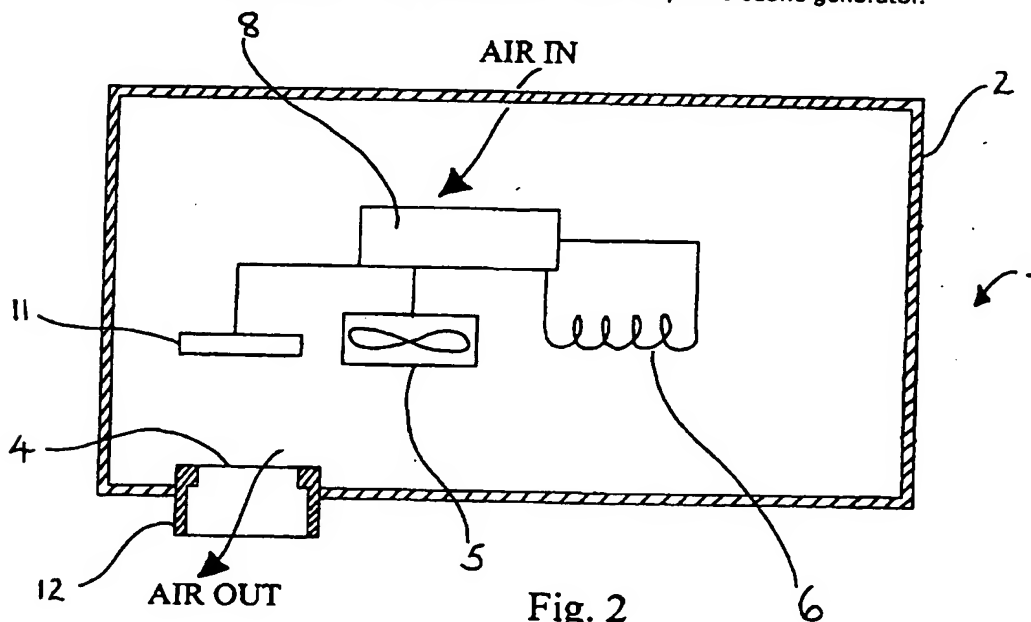
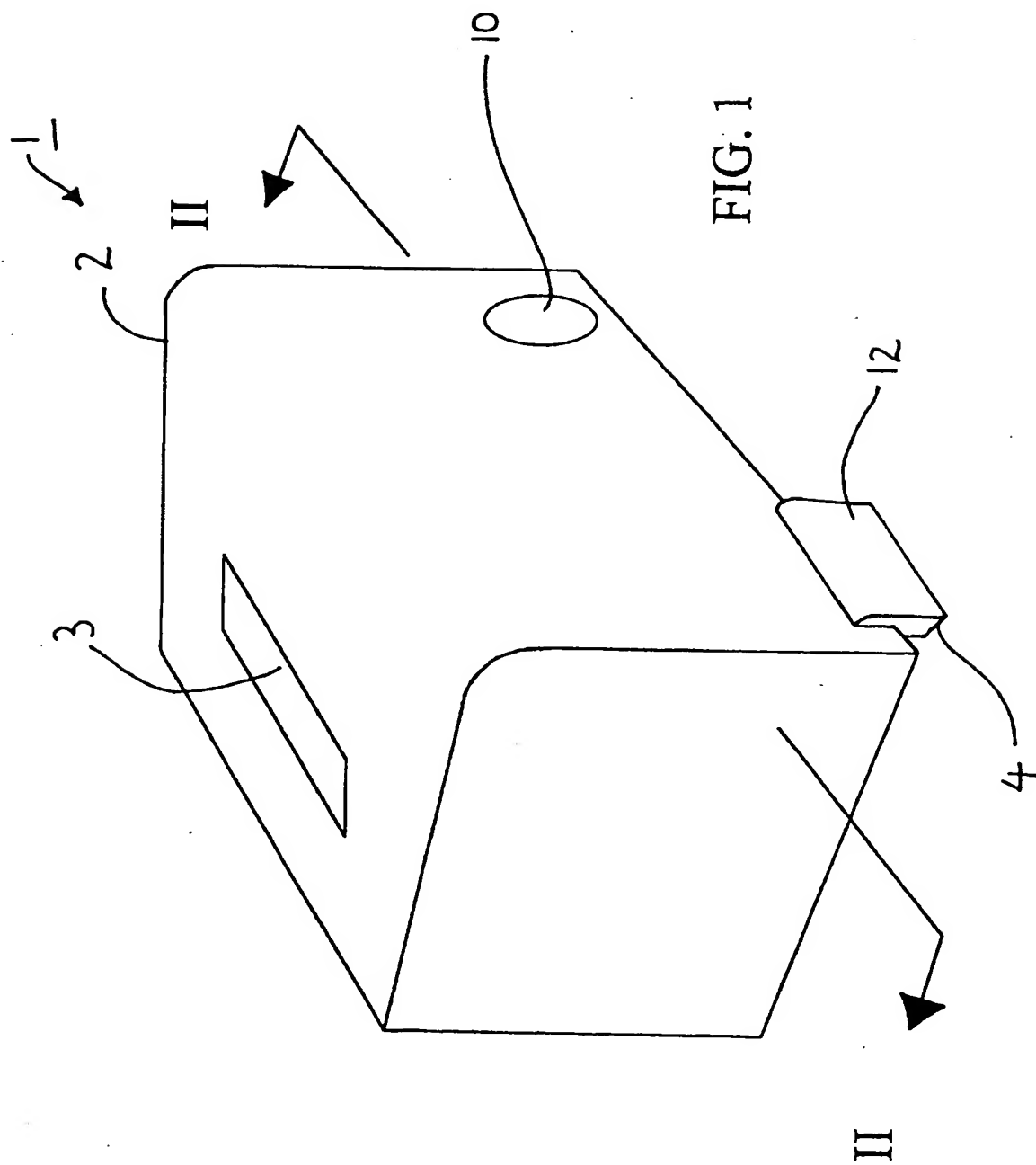


Fig. 2

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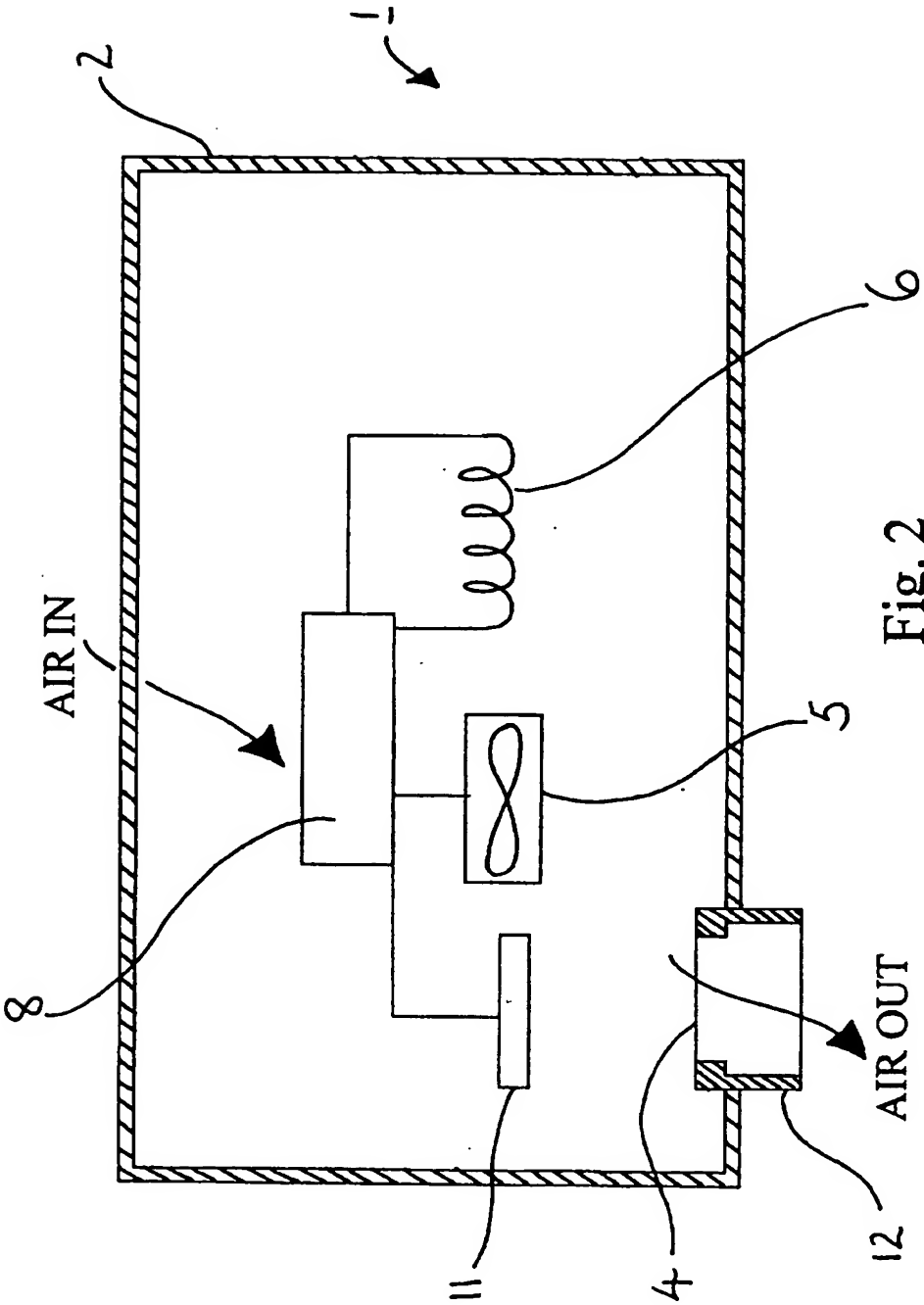


Fig. 2

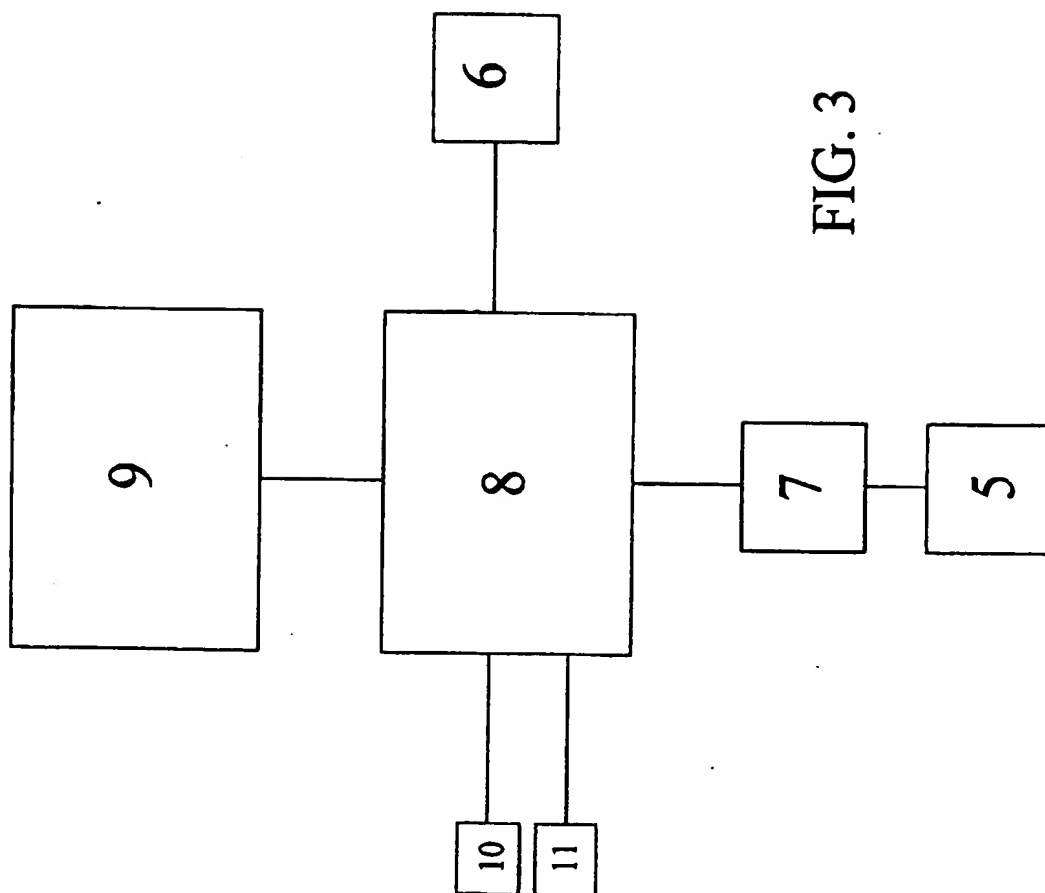


FIG. 3

## A HAND DRYER

This invention relates to a hand dryer incorporating an ozone generator,  
5 particularly, although not exclusively for use in toilets or washrooms.

Electric, warm-air hand dryers that blow a stream of warm air from a  
housing are well known. Typically, they are used in public toilets and  
washrooms for drying hands. Because of the warm, moist conditions, the  
10 interior casing of these hand dryers has been cited as a potential breeding  
ground for bacteria, which can be blown onto the hands of users of the dryer  
- with the attendant risks.

According to the present invention, there is provided a hand dryer  
15 comprising a housing having an air inlet and air outlet, a fan and heater  
housed in the housing, means for operating the fan and the heater to thereby  
generate a stream of warm air for output via the air outlet, and ozone  
generating means housed within the housing, for generating ozone from the  
air within the housing, for circulation within the housing, the ozone  
20 generating means being operable to generate the ozone during periods when  
the warm air is not been generated. This has the advantage of providing a  
hand dryer, which is self disinfecting. The generated ozone may also be  
circulated, through the air outlet, to an external environment. This may be  
achieved by running the fan, either continuously, or for a predetermined  
25 period of time, at a lower speed when the dryer is not being used as a dryer.  
This has another advantage of allowing the externally circulated ozone to  
deodorise the external environment in which the dryer is located, such as the  
washroom.

Preferably the ozone generator comprises a DC electricity supply across the electrodes to produce the ozone. This has the additional effect of producing ions as well as ozone which have been found to improve the effectiveness of the disinfecting process.

5

The invention will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 is a schematic perspective view of a hand dryer according to the  
10 invention:

Figure 2 is a schematic vertical cross-section of the hand dryer along the line II-II of Figure 1; and

15 Figure 3 is a schematic block diagram of the components of the hand dryer.

A hand dryer 1 comprises a housing 2. The housing 2 has an air inlet 3 and an air outlet 4. The air outlet 4 also includes a directional nozzle 12, which serves to direct a stream of air generated by the hand dryer in a required  
20 direction. Within the housing is a fan 5 and an electric heater 6, typically comprising a coiled heating element or other suitable heating device. The fan 5 is driven by an electric motor 7. The electric motor 7 and the electric heater 6 are coupled to a power supply 9, typically the mains power supply, via a control unit 8. The control unit 8 is also coupled to an internal switch  
25 (not shown) or a button 10 mounted on the exterior of the housing 2 for switching the hand dryer between an idle and an active state. Also provided within the housing 2 is an ozone generator 11. The ozone generator 11 can be of any suitable type, and is operable to produce ozone from air within the

vicinity of the ozone generator 11. The ozone generator 11 is also coupled to the control unit 8, and power supply 9. When the dryer 1 is in an idle state, that is not being used to provide a stream of warm air for drying, the fan 5 is running at a slow speed, sufficient to draw air into the housing 2 via the air inlet 3, through the interior of the housing, and then out via the air outlet 4. By suitable placement of the ozone generator 11, air is also passed in the vicinity of the ozone generator 11, thereby generating a quantity of ozone from the circulating air, which is then circulated out of the housing 2 through the air outlet 4, to the external environment 13 in which the dryer 1 is located. The ozone generator 11 can be provided at any suitable location, for example on a printed circuit board for the control unit 8, or mounted on its own printed circuit board. It is well known, that ozone is an effective deodoriser, and, as such, the ozone produced by the hand dryer 1, and circulated out through the air outlet 4 serves to deodorise the external environment 13, such as a washroom, within which the hand dryer 1 is located. Some of the ozone generated will also circulate within the housing 2 thereby disinfecting the interior of the housing 2 and so reducing, or eliminating entirely, bacteria breeding within the housing 2. When the button 10 is pressed by a user of the hand dryer 1 who wishes to dry his hands or face, the hand dryer 1 operates in an active state, in which the fan 5 begins to run at a higher rate thereby generating a faster stream of air for output via the air outlet 4. At the same time, the heater 6 is switched on thereby warming the generated stream of air flowing out of the air outlet 4 such that it is sufficient to dry hands or face. When the hand dryer 1 is in the active state, the ozone generator 11 is switched off, and ozone is no longer produced. The hand dryer 1 reverts to the idle state, in which the fan 5 reverts to running at the slower rate, the heater 6 is switched off, and the ozone generator 11 is switched back on, after a predetermined length of time,

or by a second push of the button 10. As an alternative to providing a button to switch the hand dryer to and/ or from the idle state to active state by means of a sensor (not shown) which detects the presence of hands or face adjacent the air outlet 4, and switches the hand dryer between the two states  
5 as appropriate.

In a preferred embodiment of the invention the ozone generator comprises a DC electricity supply across the electrodes to produce the ozone. This has the additional effect of producing ions as well as ozone which have been  
10 found to improve the effectiveness of the dryer. This combination of the ozone and the ions is to efficiently clean and sanitise the hand dryer and prevent the build up of any bacteria in any of the working parts of the hand dryer. The DC supply may be provided by the power supply means by means of a suitably rated transformer and rectifier, or alternatively by means  
15 of a battery.

The hand dryer 1 can be operable to produce ozone continuously while it is in the idle state, or it can be operable to produce ozone for a predetermined length of time after the dryer 1 has been in the active state - for example for a  
20 30 minute duration - after which time, the ozone generator 11, and the fan 5, are switched off.

In an alternative embodiment, when in the idle state, the fan 5 can also be switched off. In this case, ozone is only produced to disinfect the interior of  
25 the housing, but not to deodorise the external environment.

As will be understood by persons skilled in the art, various modifications are possible within the scope of the present invention. For example, any suitable



ozone generator can be used, as can be any suitable means of producing a stream of warm air suitable for drying.

## CLAIMS

1. A hand dryer comprising a housing having an air inlet and air outlet, a fan and heater housed in the housing, means for operating the fan and the heater to thereby generate a stream of warm air for output via the air outlet, and ozone generating means housed within the housing, for generating ozone from the air within the housing, for circulation within the housing, the ozone generating means being operable to generate the ozone during periods when the warm air is not been generated.
2. A hand dryer according to claim 1, wherein the generated ozone is circulated, through the air outlet, to an external environment.
3. A hand dryer according to claim 2, wherein the fan is operable to circulate the generated ozone to the external environment.
4. A hand dryer according to any preceding claim, wherein the ozone is continuously generated during the periods when warm air is not being generated.
5. A hand dryer according to any of claims 1 to 3, wherein the ozone is generated only for a predetermined period of time after the hand dryer stops generating warm air.
6. A hand dryer according to claim 1, wherein an ion stream is additionally provided.

7. A hand dryer according to claim 6, wherein the ozone generator comprises a DC electricity supply across the electrodes to produce the ozone and the ion stream simultaneously.